SPONDYLIDS FROM THE MEDITERRANEAN SEA AND ATLANTIC OCEAN (MOLLUSCA: BIVALVIA: SPONDYLIDAE)

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A new spondylid from the Ligurian Sea, *Spondylus cevikeri* sp. nov., is described. A spondylid from the Cape Verde Islands, possibly new and very similar to the Indo-Pacific *Spondylus linguafelis* Sowerby, G.B. II, 1847 is recorded and figured. The numerous synonyms of *Spondylus gaederopus* Linnaeus, 1758, are discussed and additional taxonomic notes presented. *Spondylus reevei* Fulton, 1915 is shown to be valid; *Spondylus limbatus* Sowerby, G.B. II, 1847 is shown to be a prior name for *Spondylus calcifer* Carpenter, 1857; *Spondylus powelli* Smith, 1892 is shown to be a junior synonym of *Spondylus senegalensis* Schreibers, 1793; *Spondylus multisetosus* Reeve, 1856 previously known only from the Indo-Pacific is now recorded from the Mediterranean Sea; *Spondylus lamarcki* Chenu, 1845, is placed in synonymy with *Spondylus spinosus* Schreibers, 1793; and variations of *S. spinosus*, including an all-brown specimen, are discussed and figured. ❐ *Spondylus, new species, Mediterranean Sea, Atlantic Ocean.*

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Spondylids are an extremely difficult group to identify by shell characters because of the high level of intraspecific variability related to growth pattern. In part of their life cycle all spondylids are attached to the substrate by the lower (right valve), at least vestigially. In some species, such as *Spondylus imperialis* Chenu, 1845, *S. pratti* Parth, 1998 or *S. regius* Linnaeus, 1758, the right and lvs are virtually mirror images of each other in terms of spination, because the right valve grows free of the substrate in adulthood. However, in the majority of species the area of attachment of the right valve is widely variable and, to some extent, the shell will mould itself to the shape of its anchorage. If they become dislodged due to wave action or some other reason, the ornamentation of the right valve will be further affected. As such, there may be little consistency in the overall shape and ornamentation of the right valve. This leaves only the top (left) valve and internal features of the shell as useful characters for field identifications. Because of the intraspecific variability of many species, such as *S. gaederopus* Linnaeus, 1758, a wide range of specimens may be necessary in order to establish accurate identification.

Reasonably reliable taxonomic characters appear to be: width of ears (auricles); inflation of left (top) valve; inflation of right (lower) valve; number and structure of ribs; ornamentation (sculpture) of ribs; sculpture of interstitial areas; external colour (in some species); internal shell colour particularly the colour of the internal margin crenulations. Problems of identification could be solved by molecular studies, sperm ultrastructure or scanning electron microscopy, and some species may yet be reduced to subordinate rank by the use of such methods. However, these tests are laboratory-based and do not help the field worker with identification of species.

The authors have had the opportunity to study spondylids from the Mediterranean Sea, the Senegal coast, Cape Verde and Canary Islands including several variations of the extremely variable *S. gaederopus*. The various synonyms (forms) of this species are discussed and a new species, *S. cevikeri*, is described. Additional taxonomic notes are also presented on several other spondylids.

ABBREVIATIONS. AMS, Australian Museum, Sydney; QM, Queensland Museum, Brisbane; DC coll, Dogan Ceviker collection; FS coll, Frank Swinnen collection; KL coll, Kevin Lamprell collection; NSW, New South Wales; Qld, Queensland; pv, paired valves; rv, right or upper valve; lv, left or lower valve.

MEASUREMENT DETAILS. Height = greatest vertical distance between the centre of the umbo and the lowest part of the ventral margin of lv, excluding spines; width = greatest horizontal distance between the anterior and dorsal margins of lv, excluding spines; depth of pv = greatest

distance between the external surfaces of the left and right valves excluding ribs and spines.

Family SPONDYLIDAE Gray,1826

Spondylus gaederopus Linnaeus, 1758
(Fig. 1)

Spondylus gaederopus Linnaeus, 1758: 1136; Schreibers 1793: 152 (based on Chemnitz, 1784: 459); Chenu 1845: pl. 1, fig. 1; pl. 2, figs 1-2,4; Sowerby 1847, figs 29, 41; Reeve 1856: fig. 13; Fulton 1915: 331, sp. 1; Lucas 1978, 6-8; Abbott & Dance 1982: 317; Lamprell 1986: pl. 1, fig. 1a.
Spondylus mediterraneus Hermann, 1781: 16.
Spondylus spinosus Martyn,1784 non Schreibers, 1793.
Spondylus inermis Monterosato, 1875: 64.
Spondylus albinus Monterosato, 1875: 64.
Spondylus coralinus Monterosato, 1875: 64.
Spondylus foliosus Monterosato, 1875: 64.
Spondylus aculeatus Philippi, 1884: 74.
Spondylus lamellosus Pallary, 1904: 52, 244.
Spondylus mixtus Koch and Pallary, 1900: 48, 371.
Spondylus unicus Jousseame, 1927: 33, 307.

TYPE MATERIAL. LECTOTYPE: Linnean Collection, London (Dodge, 1952), Mediterranean Sea.

DESCRIPTION. Shell ovate, almost equivalve, height to 90mm, rv deeper than lv. Sculpture variable, both valves usually with 8-9 ribs ornamented with irregular shaped spines that are hollow underneath, varying from spatulate to flat or sharp spines; interstices with dense small prickles. Colour of lv usually purple, rv white; some orange or all white specimens are also known. Internally the crenulations are moderately fine, purple on the lv and usually white on the rv.

DISTRIBUTION AND HABITAT. Mediterranean Sea; northwest African coast; attached to dead coral or rock amongst algae to at least 30m. Usually covered in a distinctive orange-red sponge that appears to grow only on *Spondylus* (P. Clarkson, pers. obs.).

REMARKS. In both the 1758 and 1767 editions of the 'Systema Naturae', Linnaeus gave the same brief description of *Spondylus gaederopus*: 'S. testa aubaurita spinosa ... Natum altera longior, hinc plana, ac si arte aut abrasa fuisset' with the locality 'M. Mediterraneo, arce adhaerens scopulis'. Twenty-eight figures from 9 different authors were quoted for *S. gaederopus* in the 12th edition of Linnaeus' 'Systema Naturae'. It has been shown that many of these figures refer to a number of spondylids other than *S. gaederopus* so that the diagnosis of the species by Linnaeus must be considered a composite and therefore undefined (Dodge, 1952). Dodge (1952), however, recognised a specimen of *S. gaederopus* lodged in the Linnaean Collection, London as the Linnaean type specimen. This specimen, while unidentified, not only closely agrees with the few details of the original description, but also was one of only two spondylids present in the collection.

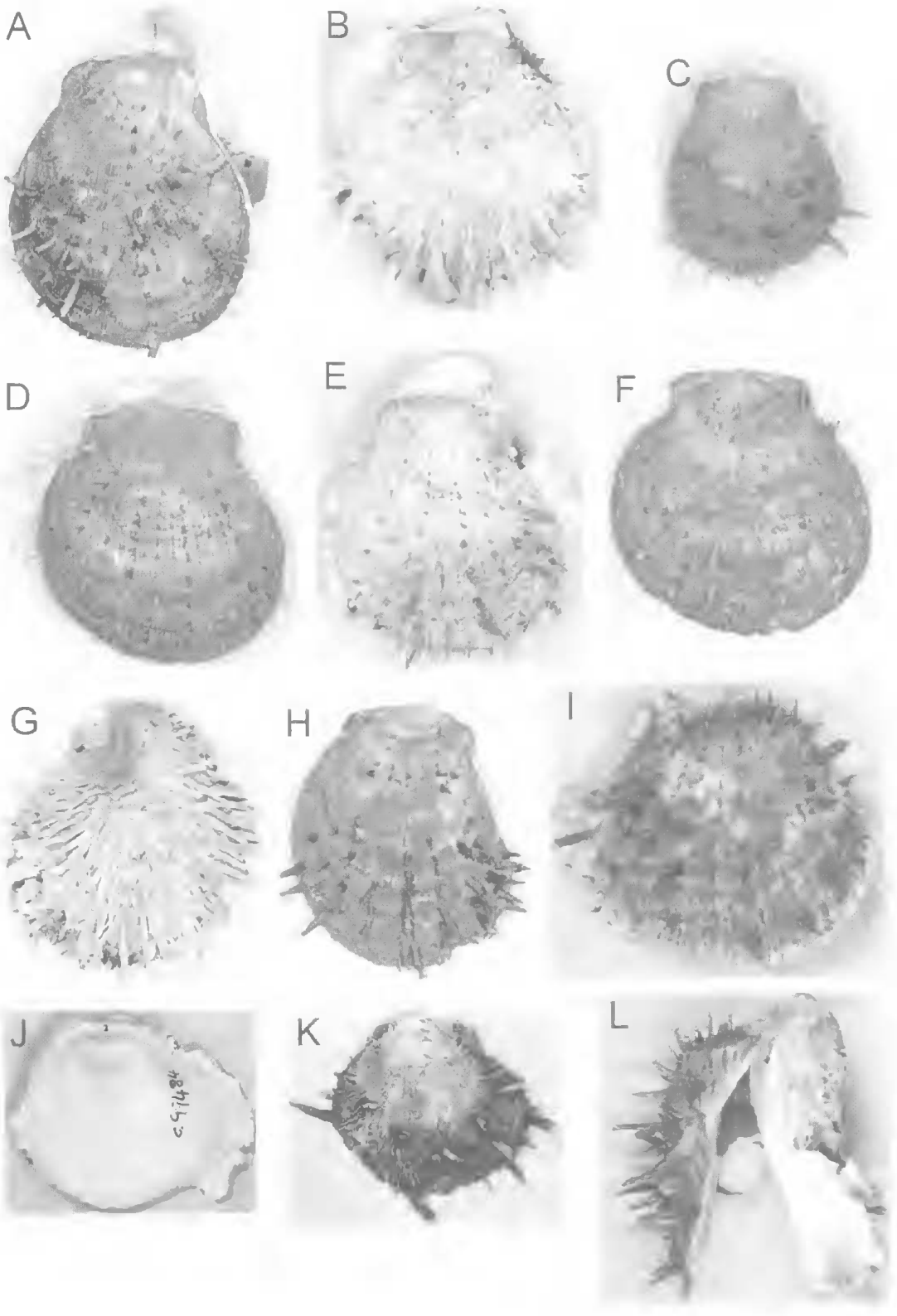
Numerous names have been used for the different forms of *S. gaederopus*. *S. spinosus* Martyn,1784 non Schreibers, 1793 was introduced for specimens possessing sparse, long spines; *S. inermis* Monterosato, 1875 for specimens with sparse sculpture without strongly developed spines or other projections; *S. albinus* Monterosato, 1875 for white shelled forms; *S. coralinus* Monterosato, 1875 for coral red forms; *S. foliosus* Monterosato, 1875 for specimens with ornamentation of large, leaf-shaped radiating lamellae; *S. lamellosus* Pallary, 1904 for specimens with numerous spatulate lamellae; and *S. mixtus* Koch & Pallary, 1900 for specimens with numerous mixed, spatulate lamellae and spines. These names, while strictly synonyms of *S. gaederopus* have nevertheless proven useful when referring to the various forms of *S. gaederopus*.

Spondylus cevikeri sp. nov.
(Figs 2F-K, 3A-C)

ETYMOLOGY. Named for Dogan Ceviker (Istanbul).

MATERIAL. HOLOTYPE: AMS C204238, 1 pv, Ligurian Sea, height 80.7mm, width 76.5mm, depth of conjoined valves 43.1mm. PARATYPES: QMMO66960

FIG. 1. A-L, *Spondylus gaederopus* (Linnaeus). A, external view, lv, form *spinosus*, DC coll 209: height 71.3mm, width 60.0mm, depth of pv 32.0mm. B, external view, lv, form *mixtus*, FS coll: height 59.5mm, width 59.7mm, depth of pv 24.0mm. C, external view, lv, form *spinosus*, KL coll, Antibes 15.0m: height 40.02mm, width 34.5mm, depth of pv 22.5mm. D, external view, lv, form *inermis*, KL coll, Ligurian Sea, 45.0m: height 66.9mm, width 61.9mm, depth of pv 38.2mm. E, external view, lv, form *albinus*, KL coll, Majorca, Spain: height 49.5mm, width 42.5mm, depth of pv 32.5mm. F, external view, lv, form *coralinus*, DC coll 265: height 84.2mm, width 83.4mm, depth of lv 23.0mm. G, external view, rv, form *albinus*, DC coll, Karatas, Adana, 60-90.0m: height 44.2mm, width 36.6mm, depth of rv 14.8mm. H, external view, lv, typical form, KL coll, Mediterranean Sea: height 79.6mm, width 65.8mm, depth of pv 40.0mm. I, L, KL coll, Bodrum, southern Aegean Sea. I, external view, lv. L, ventral view, pv. J, K, AMSC303118, 1 pv (juvenile), Eilat, Israel. J, internal view, rv. K, external view, lv: height 29.5mm, width 31.5mm, depth of pv 14.1mm.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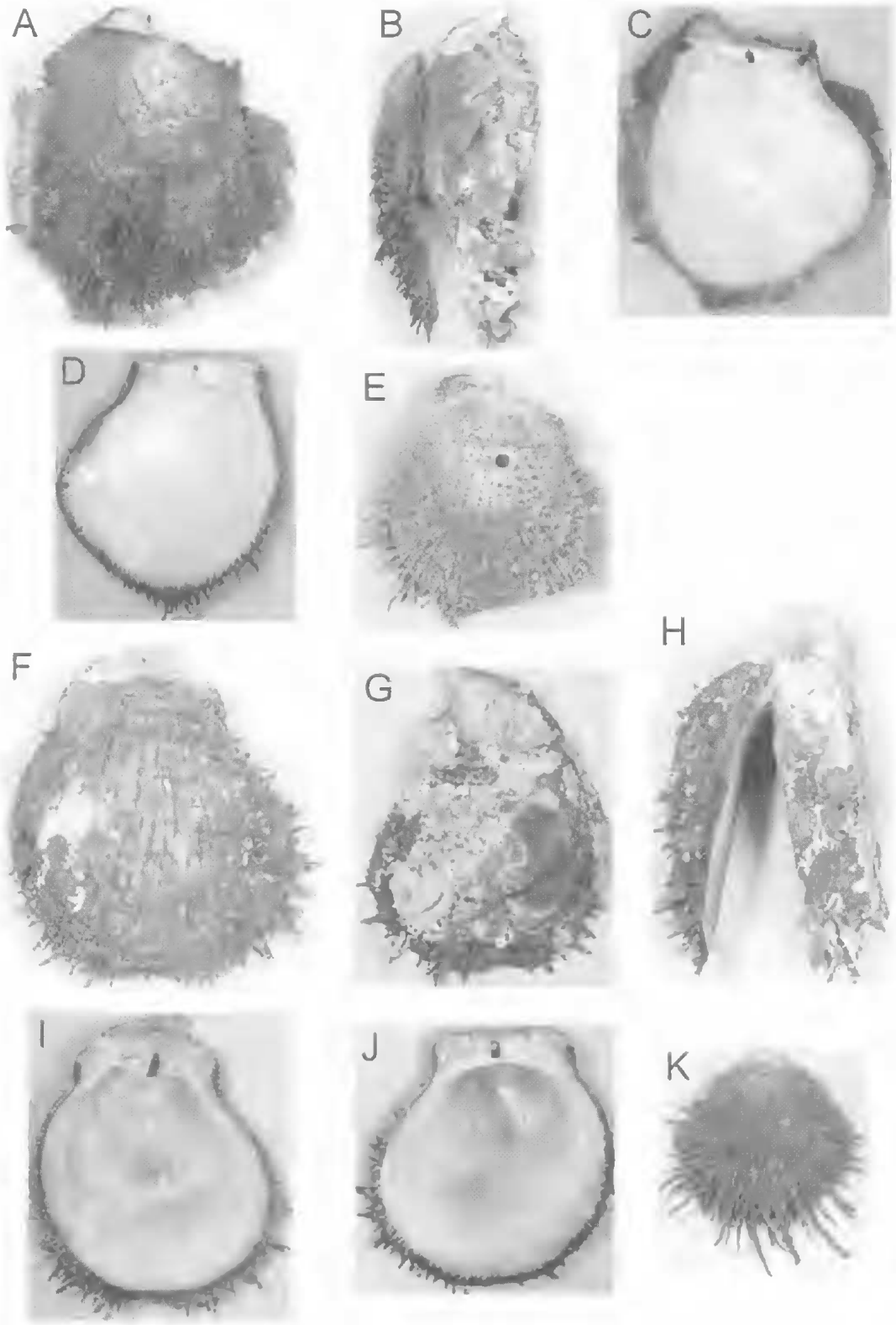
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1 pv, same data as holotype; AMSC204279 1 pv, South side of Zaborgad Island, Red Sea, P. Clarkson, x 1994; AMSC99484, 1 pv (juvenile) Bay of Stari Grad, Bosnia, 2-10m, attached to rocks.

DESCRIPTION. Shell elongate-ovate to pear-shaped. Height to 80.7mm, approximately 1.74 times greater than the auricle width. Approximately equivalve, lv moderately convex; interior slightly excavated under hinge plate, with a strong, raised, coloured crenulated margin. Sculpture consists of numerous, strong, raised radial ribs; interstices narrow with a minor riblet centrally. Major ribs bear numerous spines varying from long and slightly spatulate to short or long and sharp. Lower (right) valve equally convex as the lv; ornamentation of unattached areas more densely spined than lv; cardinal area triangular; internally with a deep excavation under the hinge plate and a strong, coloured, raised crenulated margin. Fixation area large, with foliations supporting fixed area. Colour red-purple, lighter umbonally with indistinct black lines and markings at the umbonal region; internally blue-white with dark red-purple crenulated margin, external colour visible centrally. Based on 4 specimens.

TYPE LOCALITY. Ligurian Sea.

DISTRIBUTION AND HABITAT. Ligurian Sea - Red Sea; attached to corals or rock, to 25m.

REMARKS. *Spondylus cevikeri* sp. nov. most closely resembles *S. gaederopus* Linnaeus, 1758 in shape and colouration. *S. cevikeri* can be readily separated by the purple-coloured right valve (mostly white or orange in *gaederopus*), the numerous, equally sized radial ribs and smooth interstices (8-9 ribs ornamented with irregular shaped spines varying from spatulate to flat or sharp spines and interstices with dense small prickles in *gaederopus*), dark coloured lines and marks umbonally (absent in *gaederopus*) and purple internal crenulated margins in both valves (lv purple, rv usually white in *gaederopus*).

Spondylus reevei Fulton, 1915

Spondylus hystryx Reeve, 1856: 12, 42, non Röding, 1798.
Spondylus reevei Fulton, 1915: 332, sp. 7.
Spondylus cuneus Lamprell 1986: pl. 8, figs 1A-D, non Reeve, 1856.

TYPE MATERIAL. HOLOTYPE: BMNH1984252/1, Philippine Islands.

DESCRIPTION. Shell elongately ovate, height to 90mm. Sculpture of many irregular ridges, ornamented with numerous, regular, strong, slightly depressed, blunt spines of varying lengths; interstices usually smooth but minor spines do occur in some specimens. Colour purple-red to brown, spines usually purple, internally white with a purple crenulated margin. Area of attachment variable.

DISTRIBUTION AND HABITAT. West Indies (Reeve, 1856), Mozambique, South Africa; and widely distributed throughout the Indo- and central Pacific; on and under dead coral, to 30m. Fine specimens have been collected from shipwrecks in the Solomon Islands and Palau.

REMARKS. This species was figured by Lamprell (1986) as a synonym of *S. cuneus* Reeve, 1856. Examination of numerous specimens of *S. americanus* Hermann,1781 obtained by diving off Florida by Peter Clarkson, has, in our opinion, confirmed that *S. cuneus* is a junior synonym of that species.

Spondylus limbatus Sowerby, G.B. II, 1847

Spondylus limbatus Sowerby, G.B. II, 1847: 427, fig. 51; Lamprell, 1986: pl. 16, fig. 2; Lamprell, 1998: pl. 2, figs 8,10.
Spondylus radula Reeve, 1856: pl. 14, sp. 52;
Spondylus calcifer Carpenter, 1857: 152; Fulton, 1915; 357, sp. 68; Eisenberg, 1981: pl. 145, sp. 4; Lamprell, 1986: pl. 20, fig. 1; Skoglund & Mulliner, 1996: 102.
Spondylus smithi Fulton, 1915: 357, sp. 66.

TYPE MATERIAL. HOLOTYPE: BMNH 1846.12.4.1, Persian Gulf (sic).

DESCRIPTION. Shell ovate to elongately ovate, equivalve, height to 200mm. Sculpture of 6 principal radial ribs on top (lv) with spatulate appressed spines, stronger marginally, upright umbonally; interstices with numerous radial riblets with several stronger than the others and ornamented with similar but smaller spines than on the principal ribs; rv with numerous radial ribs

FIG. 2. A-D, *Spondylus* sp. 1 pv, FS coll, St Vincents, Cape Verde Islands. A, external view, lv. B, ventral view, pv. C, internal view, rv. D, internal view, lv: height 58.5mm, width 54.0mm, depth of pv 23.2mm. E, *Spondylus linguafelis* Sowerby, 1847, KL coll, Herald Prong Reef, Swain Reefs, external view, lv: height 41.5mm, width 39.0mm, depth of pv 19.7mm. F-K. *Spondylus cevikeri* sp. nov. F-J, holotype, AMS C204238, Ligurian Sea,1 pv; F, external view, lv. G, external view, rv. H, ventral view, pv. I, internal view, rv. J, internal view, lv: height 80.7mm, width 76.5mm, depth of conjoined valves 43.1mm. K, paratype, AMSC99484, 1 pv (juvenile), Bosnia; external view, lv: height 27.3mm.

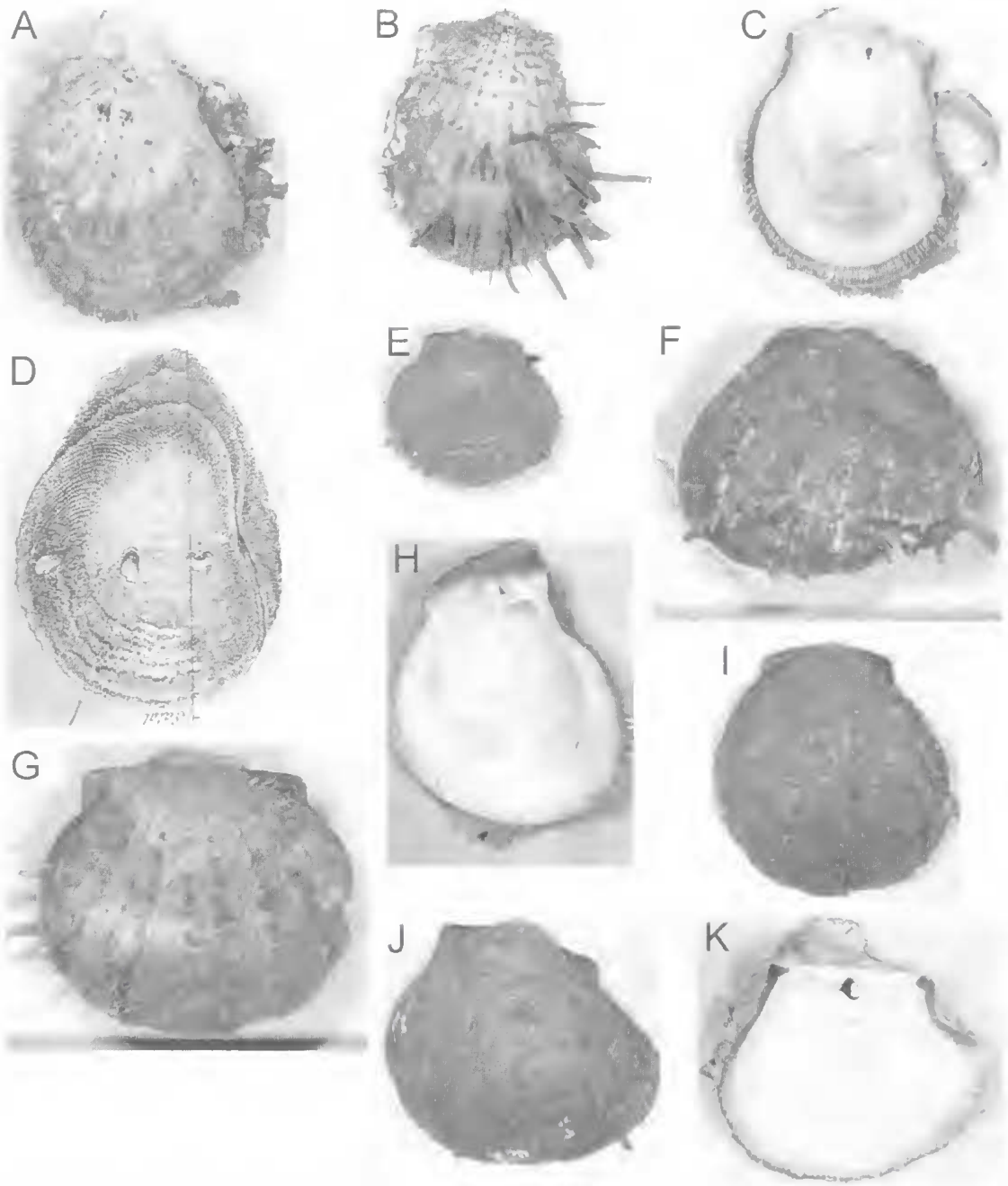

FIG. 3. A-C, *Spondylus cevikeri* sp. nov. A, paratype, AMSC204279, 1 pv, south side of Zaborgad Island, Red Sea, P. Clarkson, Oct 1994, external view, lv: height 49.1mm, width 40.7mm, depth of conjoined valves 29.1mm. B-C, paratype, QMMO66960, 1 pv, same data as holotype. B, external view, rv. C, internal view, lv. height 60.7mm, width 51.5mm, depth of conjoined valves 29.1mm. D-K, *Spondylus senegalensis* Schreibers, 1793. D, lectotype (illustration from Adanson, 1757). E-I, FS coll, Canary Islands. E, 1 pv, juvenile, external view, lv: height 24.2mm, width 26.0mm, depth of conjoined valves 13.3mm. F, 1 pv, juvenile, external view, lv: height 37.7mm, width 44.5mm, depth of conjoined valves 30.7mm. G, 1 pv, juvenile, external view, lv: height 41.0mm, width 47.0mm, depth of conjoined valves 27.8mm. H-I, 1 pv. H, internal view, rv; I, external view, lv: height 71.0mm, width 63.8mm, depth of conjoined valves 36.3mm. J-K, KL coll, 1 pv, Canary Islands. J, external view, lv. K, external view, rv: height 50.0mm, width 56.0mm, depth of conjoined valves 29.1mm.

and dense appressed, spatulate spines, interstices narrow with nine minor radial ribs and smaller, similar spines. Colour purple, maroon, orange, or brown with some yellow or white areas. Attachment area variable, but in larger specimens rv is usually entirely cemented to the substrate

DISTRIBUTION AND HABITAT. Persian Gulf (Sowerby, 1847), Sea of Cortez, Mexico and Ecuador. Attached to coral rubble, dead shell debris, or solid rock, at 1-30m. Frequently covered with a greyish maroon sponge, which usually preserves the ornamentation of the shell.

REMARKS. Sowerby (1847) described *S. limbatus* from the Persian Gulf, however examination of numerous spondylids from that area has failed to identify *S. limbatus* among them. A comparison of *S. calcifer* Carpenter, 1857 collected in the Sea of Cortez (by Peter Clarkson) and the holotype of *S. limbatus* show these are the same. Hence, until there is evidence of *S.limbatus* from the Persian Gulf, this type locality should be regarded as erroneous.

Spondylus sp.
(Fig. 2A-D)

MATERIAL. 1 pv, St Vincents, Cape Verde Islands, FS coll

DESCRIPTION. Shell; ovate; height to 58.5mm, approximately 1.73 times greater than the auricle width; both valves moderately shallow. Sculpture of numerous fine radial ribs densely spined with short to long spatulate and sharp spines; interstices narrow with dense, short, minute spines. Colour of both valves purple, white at umbonal area ; internally white, lv with purple crenulated inner margin, rv crenulated inner margin white, outer edge mauve. Area of attachment large.

DISTRIBUTION AND HABITAT. Cape Verde Islands; attached to coral, at 15-20m

REMARKS. The equi-distant and close radial ribs, fine dense spines and purple right valve colouration distinguish the Cape Verde specimen from typical forms of *S. gaederopus*. *Spondylus* sp. is most similar to short spined *S. linguafelis* G.B. Sowerby II, 1847 from the Indo-Pacific and Australia and appears remarkably similar to a purple coloured, short spined form of this species from the Swain Reefs, Queensland (Fig. 2E). The locality, while previously considered very improbable for a predominantly Indo-Pacific species, is now acceptable in the light of known ingress into the Mediterranean and Red Seas of other Indo-Pacific species of *Spondylus*. In the absence of additional material it is difficult to be certain of its correct identification.

Spondylus senegalensis Schreibers, 1793
(Figs 3D-K, 4A-I)

Spondylus senegalensis Schreibers, 1793: 162; Lamprell 1986: pl. 17, fig. 3.
Spondylus powelli Smith,1892: 36.
Spondylus hamatus Doutzenberg, 1895 non Bellardi, 1852 (fossil)

MATERIAL. 3 pv, Porto del Carmen, 1998, 20-30m by diver, FS coll; 7 pv, ix.1999, 20-30m, growth series, Los Cancajos, La Palma Island, FS coll; 1 pv, Lido, Funchal, Madeira, 20m by diver, FS coll; 1 pv, Sardina, FS coll, Canary Islands, KI coll.

DESCRIPTION. Shell pear- to fan-shaped; height to 150.0mm, approximately 1.88 times greater than the auricle width (based on measurements of 4 specimens). Approximately equivalve. Lv with 4-11 principal radial ribs, ornamented with numerous short to moderately long, depressed, blunt and sharp spines; interstices with 5 or 6 minor radial ribs; minor ribs and interstices with dense, short overlapping minor spines or imbrications; rv sculpture where visible of strong, close, radial ribs with numerous overlapping spatulate to sharp spines. Specimens examined from Senegal usually have 4-5 radial ribs with strong overlapping spatulate spines, interstices devoid of spination. Colour orange red, bright red or brown with off-white spines, internally white with red or dark brown, wide crenulated margins in both valves.

TYPE LOCALITY. Senegal.

DISTRIBUTION AND HABITAT. Madeira, Porto Santo Island, Canary Islands, Cape Verde Islands, Senegal, Liberia, Ivory Coast, Principe Islands, Cameroons and Gabon; attached to rock or dead coral.

REMARKS. *Spondylus powelli* Smith, 1892 has been placed in the synonymy of *S. senegalensis* (Schreibers, 1793). However, until specimens including a growth series were recently obtained from Mr Frank Swinnen (Belgium), both species were considered valid by several authors. Mr Swinnen's specimens have enabled a thorough examination and comparison of numerous variable forms of the species which show that although the typical fan-shaped Senegal specimens differ from the larger and often pear-shaped specimens from other localities, there is insufficient variation to separate the two

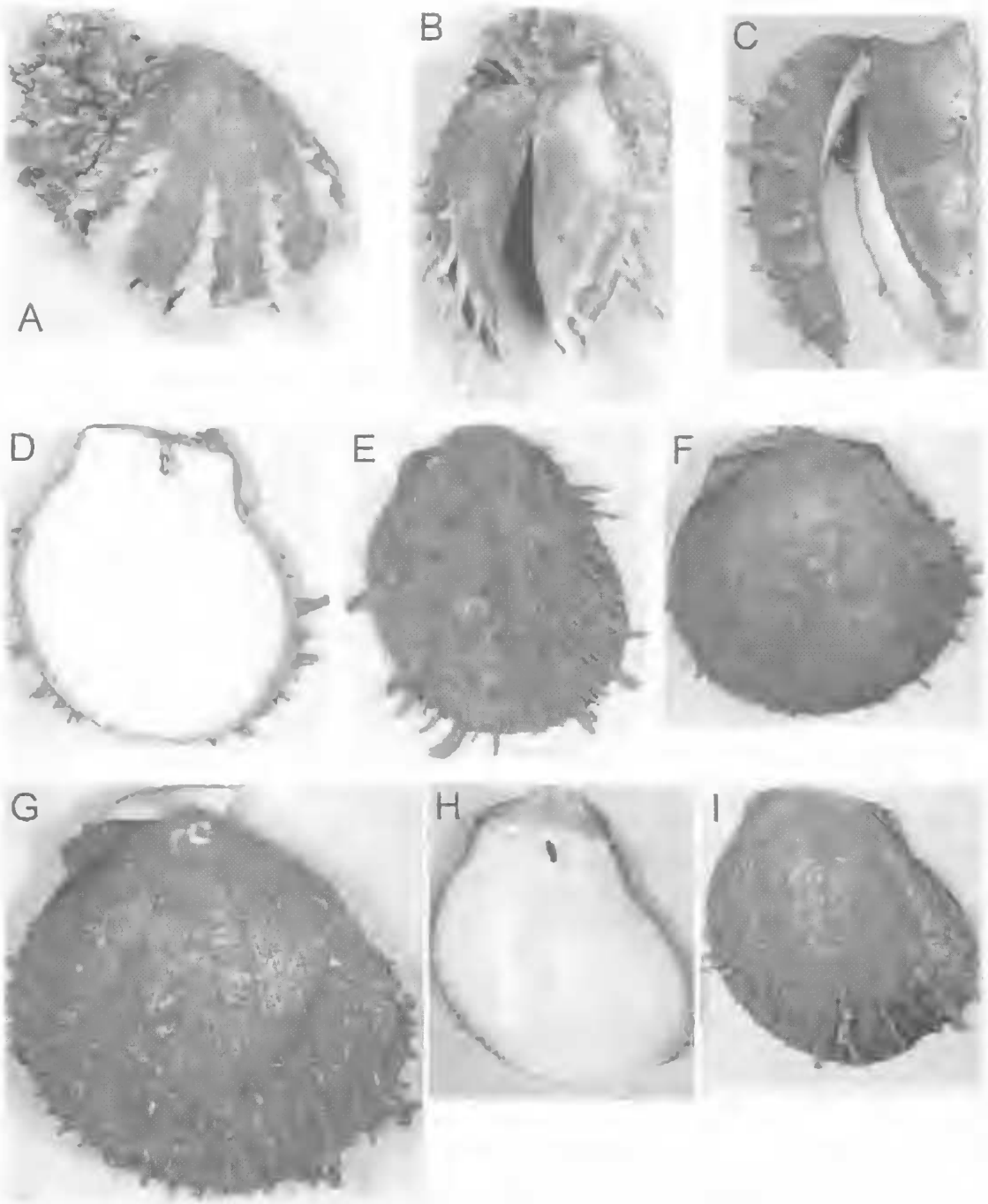

FIG. 4. *Spondylus senegalensis* Schreibers, 1793, Guinea, FS coll. A-B, 1 pv. A, external view, lv. B, dorsal view, pv; height 59.5mm, width 57.5mm, depth of conjoined valves 40.6mm. C, F, 1 pv; C, dorsal view, pv. F, external view, lv; height 89.0mm, width 83.2mm, depth of conjoined valves 50.2mm. D-E, 1 pv. D, internal view rv. E, external view of lv; height 118.7mm, width 98.3mm, depth of conjoined valves 59.5mm. G, 1 pv, external view of lv; height 115.8mm, width 119.7mm; depth of pv 71.2mm. H-I, 1 pv. H, internal view of rv. I, external view, lv; height 84.5mm; width 81.9mm; depth of pv 42.0mm.

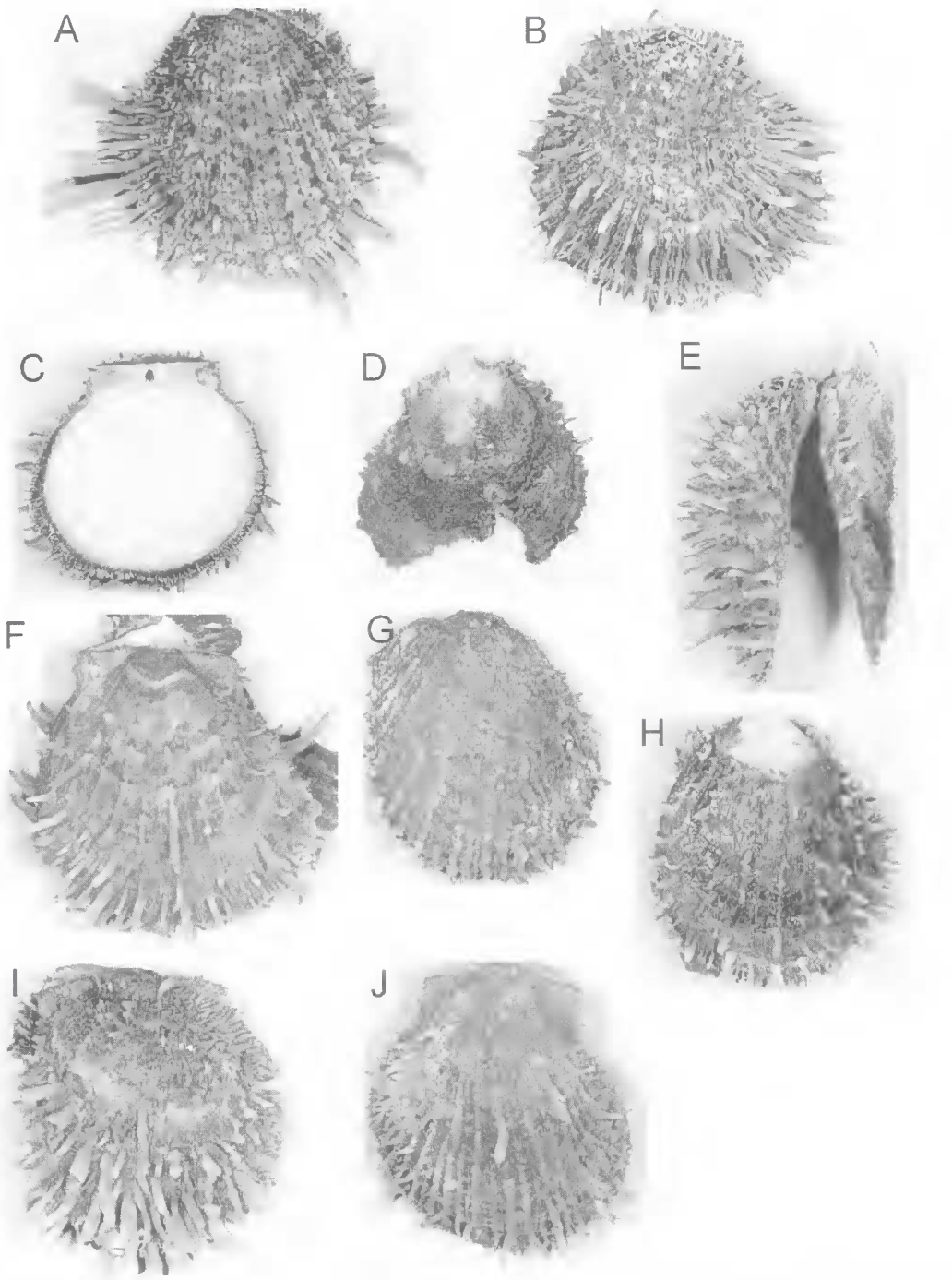

FIG. 5. *Spondylus multisetosus* Reeve, 1856. A, BMNH1998094, syntype, external view, lv. B-E, Mediterranean Sea, DC coll No. 281. B, external view, lv. C, internal view, lv. D, external view, rv. E, dorsal view, pv: height 70.2mm, width 75.2mm, depth of conjoined valves 36.6mm. F, Cebu I., Philippine Islands, KL coll, external view of lv: height 59.8mm, width 52.2mm, depth of conjoined valves 31.0mm. G-I, Mediterranean Sea, DC coll, G, No. 269, external view, lv: height 72.5mm, width 67.9mm, depth of conjoined valves 44.3mm. H, No. 270, external view, lv: height 85.0mm, width 77.0mm, depth of conjoined valves 47.5mm. I, No. 233, external view, lv: height 73.0mm, width 65.5mm, depth of conjoined valves 43.3mm. J, Capricorn Channel, Qld, 127m, KL coll, external view of lv: height 71.8mm, width 64.6mm, depth of conjoined valves 40.2mm.

forms. As a growth series of this unusual species has not been previously figured, a plate showing shape, size and sculpture variations is included.

Spondylus multisetosus Reeve, 1856
(Fig. 5A-J)

Spondylus multisetosus Reeve, 1856: pl. 3, fig. 11; Fulton, 1915: 353, sp. 48; Lamprell, 1986: pl. 13, fig. 1.

MATERIAL. 4 specimens, DC coll.: nos 233,270, Tasucu, Turkey; nos 269, 281, Iskenderun, Turkey.

DESCRIPTION. Shell ovate, height to 68mm; approximately 2.48 times greater than the auricle width (based on measurements of 4 specimens). Lv usually more inflated than the rv. Sculpture of numerous radial ribs and striae with numerous upright spines, hollowed underneath with some remote, slightly spatulate spines; interstices densely ribbed, ornamented with small sharp spines. Colour mauve or brown with some yellow on ribs and spines, sometimes yellow white, dark coloured umbonally; internally blue white with a moderately wide, dark purple-brown or variegated yellow and brown crenulated margin.

TYPE LOCALITY. Philippine Islands.

DISTRIBUTION AND HABITAT. Indo-Pacific (Philippines); Mediterranean Sea; attached to Hammer Oysters, shell debris, corals or rock in shallow, turbid water.

REMARKS. These specimens confirm this Indo-Pacific species in the Mediterranean Sea. The brown or mauve base colour and yellow upright spines distinguish *S. multisetosus* from any other Mediterranean species.

Spondylus spinosus Schreibers, 1793
(Fig. 6A-J)

Spondylus spinosus Schreibers, 1793: 154 (based on Chemnitz, 1784: fig. 460); Oyama & Takemura, 1960: 97, fig. 2; Habe 1977: 93; Lamprell, 1986: pl. 14, fig. 2a-b; Mienis et al., 1993.
Spondylus proboscideus Schreibers, 1793: 468, pl. 145, sp. 11.
Spondylus aculeatus Schreibers, 1793: 476.
Spondylus marisrubri Röding,, 1798: 460.
Spondylus dentatus Chenu, 1845: pls 25, 27.
Spondylus lamarcki Chenu, 1845: pl. 9, figs 3-4; Lamprell, 1986: pl. 15, fig. 3.
Spondylus aculeatus Sowerby, 1847: figs 11-13.

TYPE LOCALITY. Red Sea.

DISTRIBUTION AND HABITAT. Mediterranean Sea, Red Sea, Indo-Pacific (Japan, Philippines, Mauritius, Solomon Islands, north Western Australia); attached to dead coral or debris in 3m or more of water. A species frequently found within protected lagoonal environments, where it grows amongst delicate *Acropora* corals.

REMARKS. Some authors have considered *Spondylus lamarcki* Chenu, 1845 to be a variety of *S. squamosus* auct., non Schreibers, 1793 (= *S. sinensis* Schreibers, 1793) however, in *S. lamarcki* the interstitial areas are quite narrow and the shell more elongate. After examining numerous specimens we consider *S. lamarcki* to be a form of *S. spinosus* Schreibers. We have figured a wide variety of the species from the typical form with dark coloured base, white ribs and spines to the all-brown and long spined forms. Small specimens can bear long spines, but these erode as the shell grows, leaving the shell rather poorly sculptured in its adult state.

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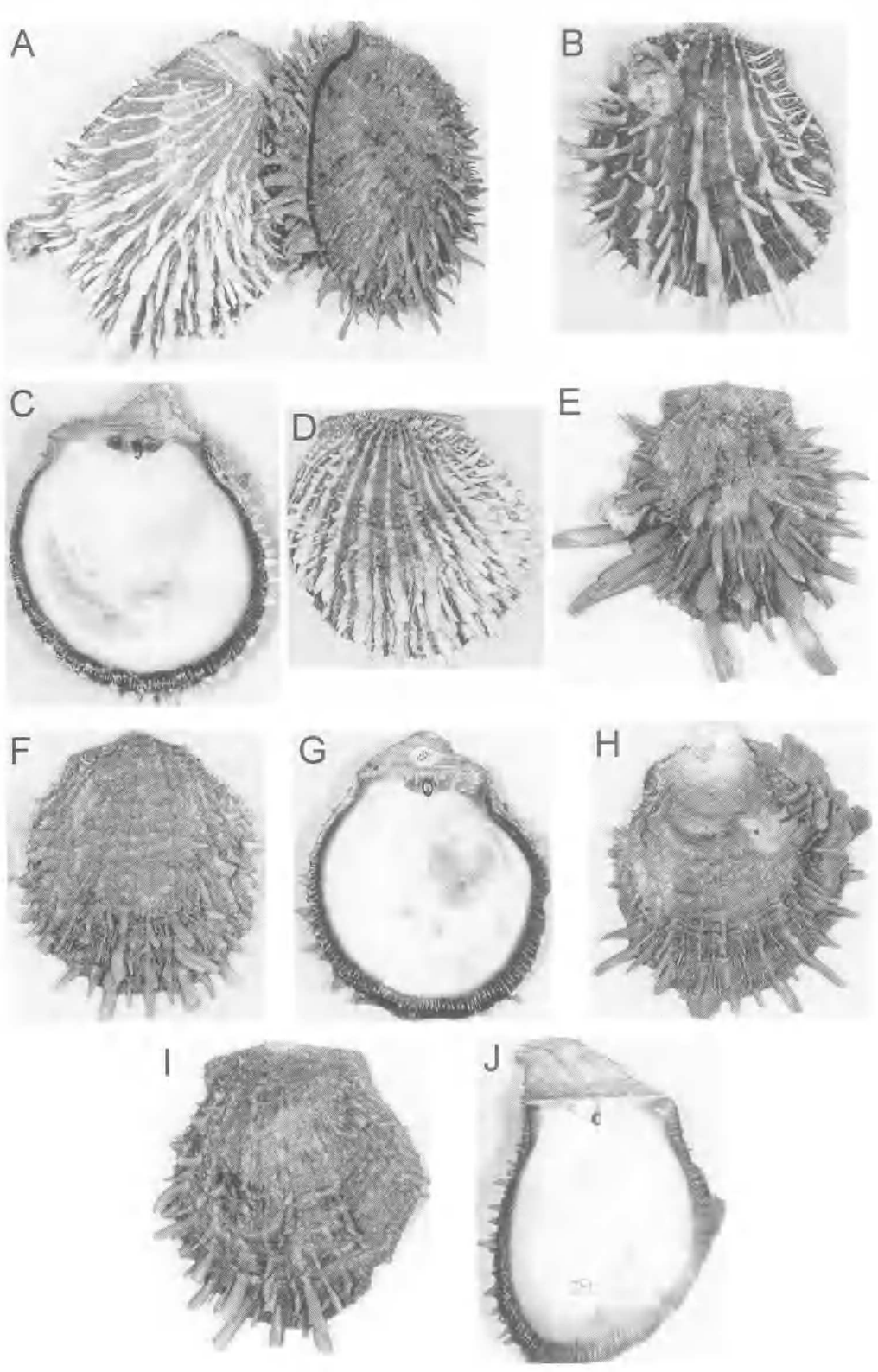
FIG. 6. *Spondylus spinosus* Schreibers, 1793. A, Mediterranean Sea (off coast of Turkey), DC coll nos 239-240, external view of two joined pvs, one all brown, one (largest) typically brown with white ribs and spines: height 89.5mm, width 76.5mm, depth of conjoined valves 56.4mm. B, external view of a lv: height 58.0mm, width 53.4mm, depth of lv 19.6mm. C-D, 1 pv; C, internal view, rv. D, external view, lv: height 78.2mm, width 73.9mm, depth of conjoined valves 45.8mm. E, external view of a lv: height 53.1mm, width 47.3mm. F-G, 1 pv, No. 246. F, external view, lv; G, internal view, rv: height 92.6mm, width 91.6mm, depth of conjoined valves 47.0mm. H, external view of a rv: height 68.0mm, width 64.5mm, depth of rv 20.0mm. I-J, 1 pv; I, external view, lv. J, internal view of rv: height 62.2mm, width 53.5mm, depth of conjoined valves 35.3mm.


A
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